

# БІОЛОГІЧНІ НАУКИ

UDC 122

## THE STATE OF INDEXES OF HETEROSPECIFIC IMMUNITY UNDER INFLUENCE OF GEOCHRONOCLIMATIC FACTORS

Sobol E.V., Sheiko V.H.

Sumy State Pedagogical University named after A.S. Makarenko

Adaptation as common universal property of living organism that provides his viability and firmness in the changeable terms of environment, as viewed as a difficult multilevel process of adequate adaptation of functional and structural elements to the factors of environment, in particular to climate, geographical breadth and longitude. Modern society is characterized by high rate of life, plenty of dataflows, rapid transport system, exactly establishment and availability of speed transport allows modern human beings to overcome thousands of kilometres, a few time and climatic zones in counted hours. A dramatic change of geographical breadth and longitude, climate, time zones is an exogenous complex factor that causes the adaptation stress-reaction of organism of humans. Under influence of geochronoclimatic factors the protective functions of heterospecific link of system immunity are diminished.

**Keywords:** geochronoclimatic factors, heterospecific link of immunity, speed movement.

**Problem definition.** The most important in physiology and medicine are questions which touch mechanisms and conformities of human organism adaptation to the different terms of environment [4; 6; 10; 11].

Modern society is characterized by high rate of life, plenty of dataflows, rapid transport system (high-speed trains, airplanes), exactly establishment and availability of speed transport allows modern human beings to overcome thousands of kilometres, a few time and climatic zones in counted hours. A dramatic change of geographical breadth and longitude, climate, time zones is an exogenous complex factor that causes the adaptation stress-reaction of organism of humans.

**Monitoring of recent researches and publications.** Adaptation as common universal property of living organism that provides his viability and firmness in the changeable terms of environment, as viewed as a difficult multilevel process of adequate adaptation of functional and structural elements to the factors of environment, in particular to climate, geographical breadth and longitude [9].

Two contradictory tendencies are distinguished in adaptation: on the one hand there are substantial changes that cover practically all systems of organism, on the other hand – adaptation is accompanied by processes which are aimed at maintenance of homeostasis and "transition" of organism on the new level of functioning by necessary maintenance of dynamic equilibrium [9; 10; 11].

Two stages are vivid in development of most adaptation reactions: first is an urgent but imperfect adaptation; second is perfect continuous adaptation. The process of transition from urgent to durable adaptation is main in adaptation process and this process identifies to efficiency of adaptation to the factors of environment [10; 11].

**Purpose.** Thus, the aim of our research is a study of indexes of heterospecific immunity of people that overcame over 6500 km and crossed 6 time zones.

**Presentation of the main material.** 50 volunteers who were divided into two groups took part in research: the first control group contained 25 persons, the second experience group contained 25 persons. All volunteers were practically healthy people ages from 25 to 45. Study is undertaken observing norms and laws of Ukraine about Bioethics [2].

The participants of an experience group overcame 6500 kilometres in 8 hours and 40 minutes, departing by airplane from "Boryspil" International airport (Ukraine) and arriving to the "Shoudu" International airport (Beijing - the capital of People's Republic China). Beijing is located in a monsoon-subtropical zone and in GMT+08:00 time zone and Kyiv is located in a mildly-continental climatic zone and in GMT+02:00 time zone. The difference of time between Kyiv and Beijing is +6 hours. Therefore duration of trip was 14-15 hours [3].

General amount of leucocytes, relative and absolute amount of neutrophils, monocytes, lymphocytes, absolute amount of erythrocytes, concentration of haemoglobin was researched. All researches were conducted on base of the medical service of "Eurasia Erlebnisreisen" GmbH, Lahr (Germany). [5; 7]

All results which we got were statistically worked according to generally accepted methodologies [1; 8].

Research of indexes of peripheral blood in both groups were conducted before the beginning, and in an experience group right after flight and in twenty-four hours after flight.

Research results are presented in table 1.

General amount of leucocytes of volunteers of the second group practically did not differ from control one, except indexes that were got after twenty-four hours after flight; where reliable reduction of general amount of leucocytes was traced as compared to control in 10%.

The heterospecific link of system immunity is formed by neutrophils and monocytes. So the

Table 1

## State of indexes of not specific link of system immunity

Indexes	Control group (practically healthy people) (n=25) M±m	Experience group (n=25) M±m		
		Before flight	Right after flight	In twenty-four hours after flight
Leucocytes, G/l	8,12±0,12	7,9±0,1	7,8±0,19	7,29±0,11*
Neutrophils, G/l	5,21±0,18	4,71±0,16	4,05±0,21*	4,6±0,15*
Neutrophils,%	64,16±0,24	60,1±0,45	52,3±0,55*	63,12±0,21
Monocytes, G/l	0,8±0,03	0,73±0,02	0,62±0,01*	0,6±0,01*
Monocytes,%	9,8±0,02	9,2±0,04	8,0±0,06	8,2±0,07
Lymphocytes, G/l	2,3±0,15	2,27±0,11	2,54±0,14	1,96±0,11*
Lymphocytes,%	28,4±0,16	28,7±0,16	32,6±0,21	26,9±0,21
Erythrocytes, G/l	5,5±0,19	5,22±0,1	5,1±0,17	4,93±0,21*
Hb, G/l	159±1,23	158±1,98	158,2±1,66	148,2±2,32*

Note: \* -  $p < 0,05$ , that is expected in relation to the indexes of control group.

absolute and relative amount of neutrophils in an experience group changed to reduction from time after flight and in twenty-four hours after flight on 22% (1.16±0,11, G/l) and 12% (0,61±0,12 G/l) accordingly. One should stress the fact that reduction of amount of neutrophils in peripheral blood of volunteers of an experience group was accompanied by reduction of relative amount of neutrophils right after flight as compared to control group and by initial data of experience group. The obtained data identifies oppression of functional activity of heterospecific link of immunity, that is formed by neutrophils.

As for absolute and relative amount of monocytes: reduction of absolute amount of monocytes in an experience group from time after flight and in twenty-four hours after flight compared to control on 22% and on 25% in twenty-four hours after flight should be noted. In comparison with initial data reduction of monocytes amount was also marked in 15% from time after flight and in 18% after twenty-four hours after flight.

On background of reduction of amount of neutrophils and monocytes there were the differently directed changes of content of lymphocytes in peripheral blood of volunteers of the second group, so right after flight a tendency was marked to the absolute increase of lymphocytes in 10% as compared to control and in 12% as compared to a initial data.

In twenty-four hours after flight reliable reduction of absolute amount of lymphocytes is traced in peripheral blood of volunteers of the second group in 15% compared to a control group and in 14% compared to initial data.

Besides from the quantitative changes of leucocytes in peripheral blood also there was reduction of number of erythrocytes, so right after flight their amount was less in 7% and in 10% after twenty-four hours after flight compared to control. Compared to a initial data of experience group amount of erythrocytes right after flight decreased in 2%, and after twenty-four hours after flight in 6%.

The quantitative changes of erythrocytes were accompanied by changes in the concentration of haemoglobin in volunteers of an experience group, so right after flight the concentration of haemoglobin did not change, and after twenty-four hours after flight decreased in 7% compared to control group and in 6% compared to initial data.

Thus, flight, that lasted 8 hours and 40 minutes from "Boryspil" International airport (Ukraine) to the "Shoudu" International airport (Beijing - capital of People's Republic China), and overcoming distance 6500 kilometres and 6 time zones caused tendency of general reduction in amount of leucocytes, reduction of absolute amount of neutrophils, monocytes, lymphocytes that specifies violation of protective functions of heterospecific link of system immunity under act of geochronoclimatic factors, that coincides with theory of stress period urgent adaptation.

**Conclusion.** Under influence of geochronoclimatic factors the protective functions of heterospecific link of system immunity are diminished.

**Prospects of further research.** Influence of geochronoclimatic factors on the indexes of cellular and humoral links of system immunity should be analysed.

## References:

1. Бессмертный Б.С. Математическая статистика в клинической профилактике и экспериментальной медицине / Б.С. Бессмертный. – М.: Медицина, 1967. – 304 с.
2. Всеобщая декларация о биоэтике и правах человека [Электронный ресурс]. – 2007. – Режим доступа по журн. : [http://www.un.org/ru/documents/decl\\_conv/declarations/bioethics\\_and\\_hr.shtml](http://www.un.org/ru/documents/decl_conv/declarations/bioethics_and_hr.shtml).
3. Википедия [Электронный ресурс]. – Режим доступа [wikipedia.org/wiki/Киев](http://wikipedia.org/wiki/Киев); [wikipedia.org/wiki/Пекин](http://wikipedia.org/wiki/Пекин).
4. Высочин Ю. В. Современные представления о физиологических механизмах срочной адаптации организма спортсменом к воздействиям физических нагрузок / Ю. В. Высочин, Ю. П. Денисенко // Теория и практика физ. культуры. – 2002. – № 7. – С. 2 – 6.
5. Исследование системы крови в клинической практике // Под ред. Г.И. Козинца и В.А. Макарова. – М.: Триада-Х, 1997. – 480 с.
6. Комплексная оценка функциональных резервов организма / А. А. Айдарлиев, Р. М. Баевский, А. П. Берсенева и др. – Фрунзе : Илим, 1988. – 196 с.
7. Лабораторные методы исследования в клинике / под ред. В. В. Меньшикова. – М. : Медицина, 1987. – 368 с.

8. Лакин Г.Ф. Биометрия / Г.Ф. Лакин. – М.: Высшая школа, 1973. – 344 с.
9. Маликов Н. В. Адаптация: проблемы, гипотезы, эксперименты / Н. В. Маликов. – Запорожье, 2001. – 359 с.
10. Павлов С. Е. Адаптация / С. Е. Павлов. – М. : Паруса. – 2000. – 282 с.
11. Hemodynamic responses following intermittent supramaximal exercise in athletes / A. Crisafulli, C. Carta, F. Melis et al. // Experimental Physiology. – 2004. – Vol. 89, No. 6. – P. 665–674.

**Соболь Є.В., Шейко В.І.**

Сумський державний педагогічний університет  
імені А.С.Макаренка

## **СТАН ПОКАЗНИКІВ НЕСПЕЦИФІЧНОГО ІМУНІТЕТУ ПІД ВПЛИВОМ ГЕОХРОНОКЛІМАТИЧНИХ ФАКТОРІВ**

### **Анотація**

Адаптація як загальна універсальна властивість живого організму, яка забезпечує його життєздатність і стійкість у мінливих умовах середовища, являє собою складний, багаторівневий процес адекватного пристосування функціональних і структурних елементів до чинників середовища, зокрема до клімату, географічної широти та довготи. Сучасне суспільство характеризується високим темпом життя, великою кількістю інформаційних потоків, швидким переміщенням транспортними засобами, саме поява та доступність швидкісного транспорту дозволяє сучасній людині за лічені години подолати тисячі кілометрів, декілька часових та кліматичних поясів. Різка зміна географічної широти та довготи, клімату, часового поясу і є екзогенним комплексним фактором, який викликає адаптаційну стрес-реакцію організму людини. Під впливом геохронокліматичних факторів порушуються захисні функції неспецифічної ланки системного імунітету.

**Ключові слова:** адаптація, геохронокліматичні фактори, неспецифічний імунітет.

**Соболь Е.В., Шейко В.И.**

Сумской государственной педагогический университет  
имени А.С.Макаренка

## **СОСТОЯНИЕ ПОКАЗАТЕЛЕЙ НЕСПЕЦИФИЧЕСКОГО ИММУНИТЕТА ПРИ ВОЗДЕЙСТВИИ ГЕОХРОНОКЛИМАТИЧЕСКИХ ФАКТОРОВ**

### **Аннотация**

Адаптация, как общее свойство живых организмов и обеспечивает его жизнедеятельность и устойчивость к изменяющимся условиям среды, представляет собой сложный, многоуровневый процесс адекватного приспособления функциональных и структурных элементов к условиям среды, а именно к климату, географической широте и долготе. Современное общество характеризуется высоким темпом жизни, большими информационными потоками, быстрым перемещением транспортными средствами. Именно появление и доступность скоростного транспорта позволяет современному человеку за короткое время преодолевать тысячи километров, несколько часовых поясов и климатических зон. резкая смена географической широты и долготы, климата, часовых поясов и есть экзогенным комплексным фактором, который вызывает адаптационную стресс-реакцию организма человека. Под воздействием геохроноклиматических факторов происходит нарушение защитных функций неспецифического звена иммунитета.

**Ключевые слова:** адаптация, геохроноклиматические факторы, неспецифический иммунитет.